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THE RELEVANCE OF VERBAL CUES TO THE BEHAVIORS OF EMR AND NON-RETARDED CHILDREN

by

© MARTHA JANE HARRINGTON

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

FALL, 1969

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The relevance of verbal cues to the behaviors of EMR and non-retarded children" submitted by Martha Jane Harrington in partial fulfilment of the requirements for the degree of Master of Education

ABSTRACT

This research was designed as an investigation of the behavioral aspects of Luria's interpretation of mental retardation. The postulate that the behavioral abnormalities exhibited by retardates are largely attributable to a lack of normal understanding and utilization of verbal cues as directors of behaviors led to the presentation of four hypotheses concerning verbal functioning. A sample of 30 educable mentally retarded children ($\overline{CA}$ 16.4; $\overline{IQ}$ 69.8; $\overline{MA}$ 11.5) was compared to a sample of non-retarded students maintaining regular school progress ($\overline{CA}$ 10.7; $\overline{IQ}$ 105; $\overline{MA}$ 11.0) on mean scores obtained on a verbally based concept formation task and a transfer task involving the same set of concepts.

The retardate sample appeared significantly less able to formulate new verbal rules for behavior, to provide verbal rationale for completed actions, and to structure behavior according to the verbal demands of others or of themselves. All four hypotheses were accepted as stated.

The findings, interpreted within a Lurian framework, lent support to the postulate that retardates appear less able to generate and subsequently utilize verbal cues to regulate their actions, and seem less able to respond appropriately to the speech of others. Support for the Lurian position was limited, in this study, to the finding of four defined verbal deficiencies exhibited by EMR students as compared to non-retarded MA peers; the further supposition that retardates exhibit a specific

verbal learning defect remained beyond the scope of the reported investigation.

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CHAPTER I

VIEWPOINT

Mental retardation is generally defined as a restricted level of intellectual functioning which results in the exhibition of subnormal behavior patterns, particularly in learning and social situations (A. M. Clarke, 1958; Gelof, 1963; Heber, 1961; Wood, 1964). Recent research has suggested, however, that the learning deficiency associated with retardation may not be general, but specific.

Baumeister (1967) proposed that much of the learning defect associated with retardation could be attributable to poor mediational processes, involving either verbal or non-verbal behavioral cues. Theoretical positions considering retardation as an impairment of verbal (Luria, 1963) and of non-verbal (Zeaman & House, 1963) mediational processes have been formulated.

An emphasis on verbal mediational behavior permeates Soviet psychology and has found recent application to the study of mental retardation. Soviet psychologists view retardation as an irreversible physiological condition underlying observable qualitative impairments in behavior. Diagnoses of subnormality are made on the basis of

> ... gross pathological signs in the case of the severely retarded; and minor physical defects, ... electroencephalogram patterns, and certain qualitative (non-standardized) tests of perception, conditioning, and concept formation (with special emphasis on the identification of specific types of language disorders) in the case of the more mildly retarded (Zigler, 1966, p. 127).

The Soviet emphasis on language disorders characteristic of retardation is largely attributable to the work of Luria (1957, 1959, 1960a, 1960b, 1960c, 1961, 1963), concerning the role of speech in the regulation of normal behavior and verbal dysfunction associated with subnormality.

Luria (1959) conceives of most human behavior as conscious and voluntary; both awareness and volition are accomplished through the development of language. Through social interaction, the individual acquires words which "name" the objects of his environment and, in so doing, direct his perception. He acquires certain patterns of motor behaviors in response to given verbal cues, resulting in the formation of verbal-motor associations.

Consequently, the verbal cue elicits the appropriate overt perceptual and motor behaviors as well as reviving, covertly, traces of previous experiences with members of that class. In this context, a linguistic label or sign evolves from being a property of a specific object to being a symbol of an object class (Schiefelbusch, Copeland, & Smith, 1967). Once the individual has internalized distinctive verbal cues in association with relevant perceptual and behavioral cues, he controls his own overt behavior through the mechanism of inner speech.

Luria suggests that, although the development of the retardate is sequential and, in some ways, parallels that of the younger normal child, the level of functioning exhibited by retardates is not synonymous to that of normals. Language, of the retardate and of others, exerts less effective controls over

perceptual and motor behaviors than would be expected.

Need for the Study

A number of Soviet and Western investigations concur that retardates appear less capable of appropriately employing verbal cues to direct their motor behavior in problem solving situations; however, little attention appears to have been given to the effects of varying pre-experimental experiences on the subsequent language behavior of subjects.

Griffith, Spitz, and Lipman (1959) and Wallace and Underwood (1964) have noted that the previous experiences of the individual determine the number or strength of implicit associative responses (IAR) accompanying a particular stimulus word. Previous experiences have the effect of varying the difficulty of the verbal task presented as a function of the availability of the required mediator in the individual's hierarchy of responses. Research has suggested that the experiences of retardates, including those concerning language, are not comparable to those of non-retarded children (Jordan, 1966; Siegel, 1963; Siegel & Harkins, 1963). The assumption that a verbal mediation task presents the same initial level of difficulty to both retarded and non-retarded subjects appears unwarrented. Consequently, the conclusion that differences in performance are attributable to varying intelligence levels may be questioned.

Bernstein (1958; 1959; 1960; 1961; 1965), working within a Lurian framework, conducted a series of investigations into the relationship between social class and language, formulating

a theoretical relationship between two models of verbal functioning and the manner in which relationships to objects are established (McCandless, 1964, p. 192). Bernstein indicated that children who acquire differing codes may "adopt quite different social and intellectual procedures despite a common potential (1965, p. 152)."

No attempt, to date, appears to have been made to relate Bernstein's model to retardation. It seems evident, however, that any consideration of verbal abilities and mediational processes must necessarily involve at least an awareness of the effect of social class on the subsequent verbal and intellectual behaviors of the individual.

Definition of the Problem

The present study was intended to further investigate Luria's contention that a verbal-motor dissociation is basic to the functioning of retardates. Specifically, the research was designed to determine whether educable mentally retarded children differ significantly from non-retarded children in their ability to use overt verbal cues to direct their motor behavior and to direct their perception. The premise that retardates are inferior in the generation of verbal self-stimuli and in their ability to appropriately employ these cues as mediators was also considered. An attempt was made to equalize the effects of varying previous social and language experiences on the performance of subjects on the experimental tasks, through controlling a number of subject and task variables relevant to language functioning.

CHAPTER II

BACKGROUND TO THE PROBLEM

Abnormalities or inadequacies in the verbal expression of retardates have generally been perceived as one consequence of diminished intellectual ability. A contrary interpretation of the dynamics of retardation characterizes Soviet theory and research, largely attributable to the speculations of Luria. In this context, abnormal behavior patterns associated with retardation are viewed as a consequence of verbal inadequacies, rather than being a parallel aspect of retarded functioning.

Precedents to the Theory

Luria's theoretical position is essentially a corollary to the work of Pavlov (1955) and Vygotsky (1966), with particular emphasis on the functioning of retardates.

As an extension of his classical or respondent conditioning model, Pavlov postulated the operation of two "signal" systems eliciting responses under specific sets of conditions. The first signal or association system was described as reflexive in nature, directly correlated to environmental events; the second signal system was perceived as dependent on meaningful language for its operation, or mediational in nature. The effect of the second signal system was to control the responses of the individual to direct stimuli through regulating his perceptions and actions. The essential character of the second signal system is evident in this statement:

> A verbal stimulus affecting the second signal system does not, in general, stand for one particular stimulus of the first signal system; it stands for a whole class of non-verbal stimuli with a certain property, or set of properties, in common. The second signal system thus makes possible high levels of abstraction (Berlyne, 1963, pp. 168-169).

The operation of the first signal system appears to parallel the one-stage (S-R) model of behavior described by Kendler and Kendler (1966); the second signal system apparently approximates the functioning of their mediational model (S-r-s-R). In behaviors represented by the mediational model, the subject is assumed to make an implicit response (r) which transforms the stimulus (s) to elicit a response. The mediational model functions to direct behavior through its revival of past experiences under similar stimulus conditions and of the consequences of hierarchies of past activities.

Vygotsky (1966) was concerned primarily with the sequential development of the mediating function of language, subsuming the operation of the second signal system. He was particularly concerned with the implications of Pavlov's postulates for the development and relationship of thought and language.

Vygotsky postulated that all mental activities originated in the child's social experiences, particularly those experiences relevant to the acquisition of language. Vygotsky described a developmental sequence in which the child, initially directed by others, acquires the ability to overtly direct his own behavior through language. Subsequently, individual verbal controls are internalized. Vygotsky, distinguishing between the role

of speech in communication and the role of speech as a self-regulator, suggested that the properties and structure of inner and outer speech differ. Internalized verbal controls were purported to lose their phonetic aspect and to remain essentially semantic.

With the acquisition of verbally cued responses, learned through the direction of others, thought and speech begin to merge. The processes and structure of thought, and the classifications of stimuli forming its basis, are thus developed through social experience. Once labels are applied to these categories of experience, symbolic thought emerges.

Vygotsky investigated the development of concepts in the child and employed language as an instrument for examining the true meaning, or level of abstraction, of concepts attached to linguistic labels at various developmental stages. Vygotsky and his co-workers devised an instrument for establishing both the level of conceptual thought which the individual utilized in approaching the problem (through his experimental behavior), and his cognitive processes (through verbal expression). He distinguished various stages of cognitive development, operationally defined in terms of test performance patterns. Vygotsky concluded that concept development is comprised of three essential phases, with various component stages (Vygotsky, 1966, pp. 52-81).

Verbal Mediation Theory

Like Vygotsky, Luria (1961) has described a regulatory de-

velopment sequence in which the child is transformed from an organism controlled by his responses to stimuli (operation of the first signal system), into one capable of initiating and inhibiting his own responses under appropriate conditions (operation of the second signal system).

The developmental stages postulated by Vygotsky and by Luria differ in emphasis on particular aspects of behavior, rather than reflecting theoretical incongruencies. The developmental stages formulated by Vygotsky circumscribe overt behaviors during task performance which exemplify the significance of linguistic labels at successive stages of development. Luria has more specifically illuminated the causal relationship subsuming these overt behaviors; the child's actual behavior at each stage is attributable to specific aspects of language functioning characteristic of his level of development.

> Perception changes from wordless perception of objects to the perception of objects guided by and expressed in words and finally to the ideation of objects represented by word symbols which do not require the object to be present. Thus the word which was originally a property of the object now becomes a symbol of it (Schiefelbusch, Copeland & Smith, 1967, p. 8).

Luria (1960a) postulated that behavior is brought under the control of verbal cues through repeated presentations of paired verbal and motor stimuli forming associations in the central nervous system. Development of self-regulation of behavior evolves as the nervous processes governing speech assume gradual control over those processes eliciting motor behaviors. As the verbal system is strengthened, adult speech acquires the func-

tion of initiating or impelling an action by the child, however, speech cannot modify or inhibit an action in progress. At this stage, the motor system sustains its initial dominance over behavior. The child's overt speech also assumes an initiating function over his motor behaviors. As speech acquires further control over action, verbal cues perform both an initiating and inhibiting function. Finally, the child's verbal regulators are internalized and the direction of response becomes covert.

The influence of verbal commands gradually shifts from their excitatory (initiating) aspect to their directive (regulating) aspect (Luria, 1961, p. 182); words cease to be the cues for specific actions and acquire the function of mediators of a class or hierarchy of appropriate responses. Regulatory speech, finally internalized, allows man to select and generalize particular aspects of a complex environment, and to formulate temporary connections (Luria, 1961, p. 183) in directing behavior to meet the changing demands of the environment.

In a Lurian framework, language is fundamental to the mental development of the individual as it facilitates both communication, necessary for vicarious learning, and symbolic thought, necessary for hypothetical problem solving (Luria, 1963, p. 151). Rather than being one aspect of mental growth, language is perceived as the key to all others.

In addition to his developmental studies of normal children, Luria (1963) observed the language functioning of retarded children, and paralleled their behavior to that of chronologically younger normal children. He found the language of the retardate

essentially restricted to initiating, rather than regulating, behaviors, and to making specific concrete referents rather than making abstract and generalized referents. He found retardates tended to evoke stereotypic behavioral and verbal responses and to incorrectly apply previously acquired responses under novel or changing conditions. Luria concluded that the retardate is less capable of using language either to formulate new intentions, directing new patterns of behavior or thought, or to perform an orienting function, directing perception towards novel, relevant cues (Luria, 1957, pp. 124-125).

Luria found retarded children less capable of adjusting motor responses to verbally given instructions, of regulating their behaviors through generalizations, of employing speech in independent thought (Luria, 1963, p. 159), and of reversing established response patterns (Luria, 1963, p. 161). He concluded that the major deficiencies observable in the retarded are

> ... (1) an underdevelopment or a general 'inertness' of the verbal system, and (2) a dissociation of this system from the motor or action system. The general effect of this dissociation ... is that a verbal response cannot serve as an adequate regulator of voluntary behavior (Zigler, 1966, p. 129).

Luria reported that verbal-motor dissociations in the mildly retarded could be partially compensated through verbal training. Combining the motor and verbal reactions of the child to artificially develop the regulatory role of speech through paired associations resulted in an improvement in motor performances (Luria, 1959, p. 18). In cases of severe retardation, however, Luria (1957, p. 128) concluded that verbal regulation of behav-

ior either could not be developed, or needed the support of continual reinforcement to remain effective. Further experimentation revealed (Luria, 1957, p. 129) that experimentally induced verbal-motor connections were wholly dependent on identical stimulus conditions for their activation, and were easily inhibited. Luria attributed this phenomenon to the retardates' utilization of the excitatory (phonetic) rather than directive (semantic) component of speech in forming associations (Luria, 1959, p. 28).

Luria (1959, 1960b, 1963) has suggested that the mechanism underlying retardation is neurological impairment, acting to affect or inhibit the formation of verbal-motor associations. The speech of the retarded individual, consequently, fails to assume its normal regulatory function. Damage serving either to interfere with simultaneous transmission of the two sets of impulses necessary for the formation of normal associations, or to weaken the verbal system so that the individual is controlled by the more dominant and intact motor system, may result in retardation. The specific defect subsuming retarded behavior is proposed to be a deficiency in appropriately engaging in verbally mediated behaviors.

Critique. Luria's basic postulate, that retardates differ from normals in the extent to which they verbally control volitional behaviors, has been subject to little empirical investigation. Luria's experiments usually involve two or three subjects exhibiting an unspecified degree of impairment of pre-

sumed neurological origin; subjects are never precisely defined regarding their level of functioning, so accurate comparisons or replications of experiments with equivalent groups are not possible. Observations of subject responses on, primarily, qualitative variables are reported; however, quantitative data collection and statistical analysis appear to be of little concern. Soviet research design appears devoid of controlled variables and control groups, leading one to question the validity of the assumption that retardates exhibit a mediational inferiority in comparison with non-retarded mental age peers.

Empirical Considerations of the Problem

Comparative studies oriented to the Lurian hypothesis, available in English, appear few in number. Although it is widely accepted that retarded individuals are deficient in verbal abilities (Webb & Kinde, 1967, p. 86), the specific relationship between subnormal verbal ability and restricted intellectual functioning has seldom been empirically considered. In his review of British and American research on verbal mediation theory, Zigler concluded that

> ... the significance of verbal mediation in retardation cannot be adequately evaluated by the existing empirical evidence (Zigler, 1966, pp. 131-132).

Rieber (1964) and O'Connor and Hermelin (1959) have applied Lurian postulates to the study of discrimination learning in retardates. Rieber concluded that verbal training improved the discrimination performances of moderately retarded subjects (IQ 70); however, it apparently exerted an adverse effect on

their response speeds. In comparison with non-retarded subjects of the same MA, retarded subjects appeared less able to apply verbal training in a mediational way on subsequent problems, lending credence to Luria's postulate. O'Connor and Hermelin reported that imbeciles required more trials to attain a criterion level of performance on a discrimination learning task; however, they required significantly fewer trials than did normals of the same MA in reaching the same criterion level on the discrimination reversal task. This pattern was attributed to the utilization of verbal mediation by normals in contrast to direct responses to stimuli utilized by imbeciles. The task was replicated with a second group of retardates, employing directed questioning to elicit the correct choice criterion during each segment of the original discrimination learning. The reversal task was devoid of verbalization. The finding that these retardates required significantly more trials to attain the reversal task criterion than did the original retardate sample was interpreted as indicating that verbal cues interfered with the learning of retardates.

Zigler (1966) questioned O'Connor and Hermelin's application of the Lurian position, suggesting that the effect of verbal mediation would be to facilitate the reversal learning of non-retardates; the more tenable hypothesis, in this view, would be the expectation of superior performances by non-retardates on both original and reversal tasks. Lack of a control group in the second experiment renders the conclusion that retardate learning is adversely affected by verbal cues questionable as the ef-

fect of other variables or experimental change is undetermined.

Other investigators have not substantiated the findings of O'Connor and Hermelin. Plenderleith (1956) and Stevenson and Zigler (1957) found no significant differences between the performances of retarded and non-retarded subjects on either discrimination learning or discrimination reversal tasks. Balla and Zigler (1964), controlling for design differences between the O'Connor and Hermelin study and its replications, found no significant differences in discrimination or discrimination reversal learning between normal subjects and comparable groups of familial and organic retardates.

Applying the Lurian position to the study of conceptual abilities, Milgram and Furth (1963; Furth & Milgram, 1965) have been concerned with the hypothesis that deaf children acquire defective verbally-cued concepts due to restricted language experiences, whereas mentally retarded children fail to utilize language experiences appropriately in developing verbal concepts. In a study involving non-retarded and EMR children of four MA levels (5.8, 7.0, 8.3, 9.9), Milgram and Furth concluded that

> retarded subjects were not inferior to normal MA controls on concept tasks in which language experience was not assumed relevant, but were inferior both in attaining a language relevant concept and in applying it to transfer tasks (Milgram & Furth, 1963, pp. 737-738).

Milgram and Furth (1963) administered discrimination tasks involving the concepts of sameness, symmetry, and opposition. Their conclusion that EMR subjects are deficient only in the acquisition of verbally cued concepts (opposition task) rather

than in concept formation ability per se (sameness and symmetry tasks) may be attributable to varying difficulty levels between the tasks they presented, not to their assumption that sameness and symmetry are non-linguistic concepts whereas concepts involving opposition are verbally induced.

A number of investigators have lent support to Luria's (1963) contention that the verbal systems of retardates, being less effective in reviving traces of past experience, result in a lessened capacity to deal with abstractions. Although the retarded subjects have a CA and, presumably, experiential advantage over their non-retarded MA peers, they appear less capable of advantageously applying prior learning and experience, particularly in situations demanding abstraction (Griffith, Spitz, & Lipman, 1959; Meyers, Dingman, Attwell, & Orpet, 1961). Bensberg (1958) and Miller and Griffith (1961) concurred that practice facilitated the performances of retardates only on specific tasks, indicating that retardates exhibit deficiencies in generalization abilities.

Baumeister (1967, p. 184), in a review of the learning abilities of retardates, suggested that studies in which the performance of retardates has not been inferior to non-retardates of equivalent MA have generally employed "meaningful and easily mediated materials", whereas studies which have demonstrated the inferiority of retardates have employed either "more abstract materials (nonsense syllables and forms) or conceptually confusing materials." Lipman (1963, p. 395) concurred with Baumeister's position, suggesting that, "a basic equal MA deficit is

characteristic of the performance of even mildly retarded subjects when the verbal material is low in meaningfulness." Rosenberg, however, (1963, p. 457), voiced his dissent with other authorities in concluding a review of research on concrete-abstract behavior in retardates with this statement:

> ... In abstraction tasks using non-verbal stimulus materials, there appears to be some tendency toward poorer performance in mental defectives. In the sphere of verbal abstractions, however, there is little evidence to suggest that abstract definitions occur less frequently in the mentally deficient.

Although none of these reviewers are referring specifically to Lurian postulates, it appears that the results of investigations into the learning abilities of retardates, limited in this instance to those studies concerning verbal mediation, have yielded equivocal interpretations. However, the nature and difficulty of the tasks presented appear to be of critical importance.

Limitations of the studies. The majority of researchers conducting comparative studies of the verbal mediational skills of normals and retardates appear to assume that the particular vocabulary necessary for success on the task they select has been developed, to equivalent strength, in both samples. Empirical reports that the vocabularies of retardates tend to be restricted (Blanchard, 1964; Mein & O'Connor, 1960; O'Connor & Hermelin, 1963) fail to support this assumption.

Most classification studies involving mentally retarded subjects have incorporated previously acquired concepts; that is, task success was dependent upon concept attainment and necessarily

assumed the relevant experiences of the subject groups to be equivalent. Jordan (1966) reported that normal family interactions are adversely affected by the presence of a retarded child. Siegel (1963) and Siegel and Harkins (1963) have shown that the language of adults is affected in interactions with retarded children as well. Such studies as these make the implicit assumption of normality of experiences or language exposure in the development of the retarded child tenuous.

A final comment regarding this body of research concerns the usual conclusion that differences in performance are wholly attributable to the effects of varying levels of intelligence. This assumption, in the face of a number of relevant uncontrolled variables, appears unwarrented.

Sex differences appear related to language skills in both normal (McCarthy, 1954) and retarded (Goda & Griffith, 1962; Sirkin & Lyons, 1941; Spradlin, 1960) samples, yet this variable was uncontrolled in the studies cited.

Bernstein (1958, 1959, 1960, 1961, 1965) considered the influence of social class, as the determinant of both the behavior and language of its members, on the development of cognitive traits, and described two polar models of verbal functioning. A restricted code, associated with lower socio-economic status (SES) tends to be direct and concrete, non-analytical, and largely comprised of statements concerning present objects and events. An elaborated code, however, associated with middle-class functioning, tends to be "analytical and explanatory, with many qualifications and precision of vocabulary (A. D. B. Clarke,

1958, p. 129)." Irwin (1948) and McCarthy (1954) report that children of lower SES exhibit poorer speech than do children of higher SES. This variable is of particular importance as SES also exhibits a demonstrable relationship to measured verbal intelligence (Bernstein, 1960; Lesser, Fifer, & Clarke, 1965; Maxwell, 1961).

Premise of the Study

Although a considerable body of Soviet and Western research suggests that retardates have poorly developed verbal mediational skills in comparison with normal children of the same MA, little attempt appears to have been made to control the effect of the prior experiences of the subjects on their subsequent verbal mediational abilities.

The present study was proposed to compare the abilities of EMR and non-retarded children of equivalent MA to employ a novel set of verbally cued concepts in a series of tasks. The Lurian position indicated that EMR children should exhibit deficiencies in both the ability to verbalize appropriate cues to direct overt responses and the ability to subsequently employ these cues to control their behavior. The postulate that retarded children are restricted in their ability to respond to the speech of others was also considered.

The study was designed to control the effects of differing pre-experimental experiences and of vocabularies of varying applicability to the tasks, so that the tasks presumably presented an equivalent initial level of difficulty to both samples.

A number of empirically relevant subject variables were also controlled.

CHAPTER III

DESIGN AND RATIONALE OF THE STUDY

The purpose of the study was to investigate Luria's contention that the primary characteristics of retardation are an inert verbal system and a dissociation of verbal and motor behaviors. Research on the verbal mediational abilities of retardates appears heterogeneous in terms of sampling, instrumentation, definition of subjects, criterion level of performance, and other variables. Although the empirical evidence implies that retardates, as compared to MA normal controls, exhibit a deficiency in the ability to apply verbal mediators to behavior, the need for more rigorous investigation is apparent. A number of variables, related to both subjects and task, have been controlled in the present investigation.

Subjects

Subjects were selected from two schools of the Edmonton Public School Board. Retarded subjects were selected first; nonretarded subjects were then selected on the basis of a number of relevant controlled variables. Sample membership was defined primarily in terms of IQ and MA, and secondly by SES and sex. Subject data are presented in Appendix F. Each sample was arbitrarily designated to contain 30 individuals so data could appropriately be subjected to statistical analysis.

Preliminary information was obtained through inspection of cumulative records and interviews with classroom teachers. Child-

ren having known sensory defects, motor defects, central nervous system disorders, or emotional problems were excluded from consideration. The retarded subjects were therefore assumed to have a mental handicap of familial or idiopathic origin (Cameron, 1968, p. 58). Non-retarded subjects who had not maintained regular school progress were also excluded from consideration. Neither sample included children of known foreign language background.

Retarded subjects were selected from a population of students in senior opportunity room placement at McKay Avenue Laboratory School. Senior opportunity room students were selected as the retardate sample because of the availability of non-retarded subjects of equivalent MA; choice of a younger retardate sample or a sample displaying more severe retardation would have necessitated the inclusion of pre-school children in the equivalent MA group. The specification of this retardate sample also presupposed maximal opportunity for verbal skill development among the retardates. A final significant consideration involved in the choice of this sample was the difficulty of the task. O'Connor (1958), reviewing concept formation research, stated that the use of principles in problem solution is seldom found below a mental age of 8 or 9.

Retarded individuals displaying none of the debilitating factors previously mentioned were selected on the basis of assessments on the Wechsler Intelligence Scale for Children (WISC) or the Wechsler Adult Intelligence Scale (WAIS). Assessments were performed during December, 1968, and January, 1969, by

graduate students enrolled in Educational Psychology 524, at the University of Alberta, under the direction of a certified psychologist.

The retarded subjects, termed educable mentally retarded (EMR), were operationally defined as obtaining IQ scores in the range 50 to 80 derived from a standardized individually administered intelligence test (WISC or WAIS). Intelligence quotients obtained on Wechsler tests were converted to mental age scores by the Wechsler (1949, p. 112) formula.

A comparable MA sample was selected from a population of "normal" subjects attending Mount Pleasant Elementary-Junior High School. The Wechsler Intelligence Scale for Children was administered by two trained examiners during April, 1969 to 40 students. Non-retarded subjects, in the present study, were operationally defined as obtaining IQ scores in the range 90 to 120 derived from a standardized individually administered intelligence test (WISC). Intelligence quotients obtained on the WISC were converted to mental age scores by the Wechsler formula. Subjects were chosen from this group on the basis of MA scores falling within the range previously calculated for the EMR group.

The finding of an insignificant chi square value ($X^2 = 2.36$; $p > .90$) indicated that no significant difference existed between the MA distributions of the two samples (see Table 1).

Samples were not significantly different in sex distribution ($X^2 = 2.41$; $p > .05$) (see Table 2). This variable appeared relevant to the present study as patterns of Vygotsky test perfor-

TABLE 1

CHI SQUARE TEST OF GOODNESS OF FIT: MA SCORES

INTERVAL	FREQUENCY DISTRIBUTION		X^2	p*
	NON-RETARDED	EMR		
14.0-14.3	1 ┐ 1	2 ┐ 3	1.33	
13.4-13.11	0 ┘	1 ┘		
12.8-13.3	4	4	0	
12.0-12.7	4	5	0.20	
11.4-11.11	3	3	0	
10.8-11.3	5	4	0.25	
10.0-10.7	4	4	0	
9.4- 9.11	5	4	0.25	
8.8- 9.3	4	3	0.33	
N =	30	30	X^2 = 2.36	> .90

* df = 7

TABLE 2

CHI SQUARE TEST ON DISTRIBUTION BY SEX:

EMR AND NON-RETARDED SAMPLES

SAMPLE	N	N MALES	N FEMALES	X^2	p*
EMR	30	13	17	2.41	>.05
NON-RETARDED	30	19	11		

* df = 1

mance (Hanfmann, 1941) as well as language skills have been noted to differ between sexes.

A social class or SES rating was assigned to each subject on the basis of father's occupation; ratings were obtained from the Socio-Economic Index for Occupations in Canada (Blishen, 1967). Elley (1961) has suggested that the Blishen scale is appropriate for use with Edmonton samples as all occupational groups on the scale are well represented. Blishen scores were obtained for all subjects with the exception of three children (two EMR, one non-retarded) in foster home placement, for whom data were unavailable. These subjects were excluded from consideration when variances and means for occupational index scores for each sample were calculated. Although exclusion of these subjects might conceivably have affected these calculations, it was felt that the effect would be slight due to the smallness of the numbers of subjects involved in each instance. No significant difference was obtained between the variances ($F = 1.50$; $p > .10$) or means ($t = 0.10$; $p > .10$) of the two samples on socio-economic status thus calculated (see Tables 3 and 4).

Kasanin and Hanfmann (1938) suggested that level of education influenced Vygotsky test performance. However, as they were referring specifically to post-secondary education, and as educable mentally handicapped children generally do not adhere to a conventional grade level curriculum, grade level equivalence between samples was considered irrelevant to the demands of the present study.

TABLE 3

TEST OF HOMOGENEITY OF VARIANCE:

BLISHEN SCALE SOCIO-ECONOMIC INDEX

SAMPLE	N	s^2	F	p*
EMR	28	37.7589	1.50	> .10
NON-RETARDED	29	56.5443		

* df = 27,28

TABLE 4

TEST OF SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS:

BLISHEN SCALE SOCIO-ECONOMIC INDEX

SAMPLE	N	MEAN	S.D.	t	p*
EMR	28	34.61	6.14	0.10	> .10
NON-RETARDED	29	34.42	7.52		

* df = 55

Instrument

As the Lurian approach to mental retardation is largely a special application of Vygotsky's postulates regarding the development of thought and language and their relationship to overt behavior, it appeared appropriate to employ an experimental technique devised by Vygotsky in this study. The Vygotsky materials appeared appropriate also in their presentation of nonsense syllables as the relevant verbal cues, thereby equalizing the initial level of task difficulty to all subjects. The use of conjunctive classification categories had the advantage of controlling, to some extent, the influence of previous experience on performance on the experimental task.

The Vygotsky (1966, pp. 56-57) test of concept formation consists of a set of geometric shapes distinguishable into four categories on a height by width criterion. Each category is designated by a nonsense syllable: lag, cev, bik, or mur. Vygotsky's contention that the word evolves from an object property to an object symbol is central to the experience of the subject in successfully completing the task. Vygotsky employed this task as a qualitative indice of the individual's level of functioning; each performance was ascribed, by its overt characteristics, to a specific phase of concept formation development. Appendix A presents a detailed description of the materials and traditional administration of the Vygotsky test.

Administration and scoring. A global assignation of level of functioning does not lend itself appreciably to statistical

analysis, nor to a consideration of specific aspects of functioning within the total performance which might be of value in examining quantitative differences between groups of subjects. Therefore a more objective and quantitative scoring technique appeared advisable in the present study.

Penny (1951) proposed a method of administration and scoring for this instrument which would: shorten administration time, standardize the testing situation, systemize data collection, provide quantitative measures of performance, and render the test applicable to a wider range of subjects. (See Appendices B and C).

The Penny scoring system yields quantitative data on several aspects of individual performance:

(a) "cm", the number of successive correct moves at the end of the test,

(b) "clues", the number of corrections made by the examiner plus the number of "guessed" moves,

(c) "Rev." (reversions), the number of repetitions of previously corrected moves, excluding "guessed" moves,

(d) "systems used", the number of systems employed,

(e) "C:Us" (common-uncommon systems difference), the difference between the number of common and uncommon systems used,

(f) "C:Um" (common-uncommon moves difference), the difference between the number of common and uncommon moves used,

(g) "M:S" (multiple system difference), the difference between the numbers of multiple and single grouping cri-

teria used,

(h) "R per cent" (rigidity per cent), the percentage of moves according to a preferred incorrect system.

The validity of the Vygotsky test as a quantitative measure of behaviors relevant to the Lurian position appears theoretically defensible. The identical theoretical perspectives of Luria and Vygotsky suggest this instrument has sufficient face validity to make it acceptable as a measure of those aspects of behavior central to the present study.

Reliability studies using data derived under the Penny method of administration and scoring are not available. However, Meece and Rosenblum (1965), using the Semeonoff and Laird (1951) formula to compute total scores, indicated that their subjects (grade six girls) performed very much like adults in terms of average scores. Although demonstrations of statistical reliability on the same population are impossible due to the form of the instrument, Aldrich (1944) reported close similarities in performance scores between his sample and a parallel sample reported by Hanfmann and Kasanin (1937). This implies reliability of performances under identical methods of administration and scoring. Criticisms of inter-examiner reliability (Semeonoff & Laird, 1951) have largely been invalidated by the method of administration and scoring devised by Penny (1951).

The Vygotsky test, under Penny's scoring criteria, was assumed to have sufficient validity and reliability to be admissible as a data collection instrument in the present study.

A second set of materials, consisting of nine white plas-

ter cylinders arranged in a 3 X 3 matrix, was employed in a transfer task. Irrelevant stimulus dimensions (form and color) were controlled; only dimensions relevant to the concepts of the Vygotsky test (height and width) were allowed to vary. A full description of the transfer task materials is presented in Appendix E.

Procedure

The Vygotsky test was administered under a modification of the Penny method devised by the present investigator. The desirability of such modification became obvious during a pilot study of the reported research, involving comparable subject groups. (See Appendix D). Response data were recorded on the Vygotsky Record Form (Appendix C). The transfer task was administered by the procedure presented in Appendix E. Both tasks were administered to all subjects by the same examiner; task completion required approximately 30 minutes per subject. No methodological difficulties in data collection, in terms of those variables of behavior utilized, were noted.

Scoring of subjects' performances on the Vygotsky test was conducted according to the Penny method. Although the Penny scoring system yields quantitative data on various aspects of Vygotsky test performance, two measures, rigidity per cent score and guessed response score, appeared most relevant to Lurian theory. In addition, the number of errors of placement made during second Vygotsky administration (error score A) and the number of errors made on the transfer task (error score B) were

obtained.

Rationale. Rigidity per cent score, or the percentage of moves according to a preferred incorrect system, was considered as a measure of the subject's inability to generate a new verbal rule for overt responses, despite verbal instructions that his previous response was incorrect. The retarded individual, if less capable of utilizing given verbal cues and of producing new verbal self-instructions, would be expected to exhibit a higher rigidity per cent score than a non-retarded individual.

The second relevant aspect of Vygotsky test performance was guessed response score, or placements of blocks which could not subsequently be verbally explained. The retarded individual, if less able to verbally plan and control his actions, would be expected, in the experimental situation, to exhibit a higher guessed response score than a non-retarded individual.

The number of placement errors made by the subject during second Vygotsky administration was obtained and designated, within the present study, as error score A. This score was considered as a measure of the subject's inability to perform a task according to his own verbal instructions. If retardates are less able to assimilate verbal instructions and less able to regulate their responses to meet the demands of acquired verbal rules, the retarded individual would be expected to exhibit a higher error score A than a non-retarded individual.

Error score B, or errors of choice on the transfer task, was considered as a measure of the subject's inability to regu-

late his perception and choice behavior according to self-verbalized criteria. If the retarded individual is less able to use acquired linguistic labels as mediators of his behavior, he would be expected to exhibit a higher error score B than a non-retarded individual.

Statistical Analysis

Vygotsky test data were transferred from Vygotsky Record Forms to Tabulation Sheets (Appendix C); rigidity per cent scores for all subjects were calculated. Subjects' data for rigidity per cent scores, guessed response scores, error scores A, and error scores B are presented in Appendix G.

Raw scores for each sample were summed for each data category separately, and means and variances of the distributions calculated. Each set of data appeared amenable to analysis by a directional *t* test for independent samples (Ferguson,1966, pp. 167-169).

Assumptions underlying the *t* test are (a) normality of distribution of the trait in the populations from which the samples are drawn and (b) homogeneity of variance of the trait in the populations from which the samples are drawn (Ferguson, 1966, p. 168).

Hays (1963, p. 322) indicates, however, that deviations from normality have little effect on the validity of the statistical decision unless sample sizes are small and observed *t* value is proximal to the critical *t* value. Games and Klare (1967, p. 302) suggest that deviations from normality have little sig-

TABLE 5

SUMMARY OF TESTS OF HOMOGENEITY OF VARIANCE

VARIABLE	GROUP	VARIANCE	F	df	p
RIGIDITY PER CENT SCORES	EMR	392.993	2.87	29/29	>.10
	NON-RETARDED	136.852			
GUESSED RESPONSE SCORES	EMR	43.289	33.58	29/29	>.10
	NON-RETARDED	1.289			
ERROR SCORES A	EMR	18.395	15.15	29/29	>.10
	NON-RETARDED	1.214			
ERROR SCORES B	EMR	1.495	1.09	29/29	<.02
	NON-RETARDED	1.637			

nificance when degrees of freedom exceed 25. As the present study involved 60 subjects, the assumption of normality of distribution was considered unnecessary to valid interpretation of the data. Normality was therefore not statistically examined.

The second assumption, homogeneity of variance, was tested for each set of data using the formula given by Ferguson (1966, p. 182). The assumption of homogeneity of variance was accepted for one set of data, error scores B, and rejected in three instances, rigidity per cent scores, guessed response scores, and error scores A. Tests of homogeneity of variance are summarized in Table 5.

For sets of data not displaying homogeneity of variance, t was calculated by the Cochran and Cox formula (Ferguson, 1966, pp. 171-172), making an adjustment in the value of t required for significance at the critical level designated. For the set of data displaying homogeneity of variance, t was calculated by a directional t test for independent samples (Ferguson, 1966, pp. 167-169).

The hypothesis was accepted when the calculated t value for that set of data exceeded the critical value of t obtained from inspection of the tables ($\alpha = .05$).

CHAPTER IV

HYPOTHESES

Luria has postulated that mental retardation, being associated with a verbal learning defect, is characterized by underdevelopment of the verbal system and a deficiency in verbal regulation of motor behaviors. The behavioral consequences of these characteristics, defined by specific aspects of Vygotsky test behavior, should result in the observation of significant differences in functioning between EMR children and non-retarded children of equivalent MA. The following verbal hypotheses are therefore advanced:

Retardates maintain a previously corrected verbal behavior pattern more frequently than non-retardates, as indicated by rigidity per cent score.

Retardates exhibit motor behaviors unaccompanied by specific verbal direction more frequently than non-retardates, as indicated by guessed response score.

Retardates are less able than non-retardates to maintain behavior patterns in accordance with self-verbalized criteria, as indicated by error score A.

Retardates are less able than non-retardates to use acquired linguistic labels as mediators in a transfer situation, as indicated by error score B.

The derived testable hypotheses are:

H_1: The mean rigidity per cent score of the retardate sample is significantly greater than the mean rigidity per cent score of the non-retardate sample.

H_2: The mean guessed response score of the retardate sample is significantly greater than the mean guessed response score of the non-retardate sample.

H_3: The mean error score A of the retardate sample is significantly greater than the mean error score A of the non-retardate sample.

H_4: The mean error score B of the retardate sample is significantly greater than the mean error score B of the non-retardate sample.

CHAPTER V

RESULTS AND INTERPRETATION

Mental retardation, as described by Luria, is not the result of global intellectual impairment, but constitutes a specific verbal learning defect. Therefore, significant differences in various aspects of verbal functioning, displayed in Vygotsky test behavior, and on a transfer task, were hypothesized to exist between an educable mentally handicapped sample and a chronologically younger non-retarded sample of equivalent mental age.

Consideration of the Hypotheses

Significant differences were proposed to exist between the mean scores of the samples on four measures: rigidity per cent score, guessed response score, error score A, and error score B.

Means and variances used in calculating *t* for rigidity per cent scores, guessed response scores, and error scores A are presented in Tables 6, 7, and 8. Table 9 presents means and standard deviations used in calculating *t* for error scores B.

All hypotheses were accepted as stated. The *t* values calculated between the means of the two groups on rigidity per cent scores ($t = 4.595$), guessed response scores ($t = 3.992$), and error scores A ($t = 5.021$) are significant at the .0005 level for a directional test. A *t* value of 2.785, calculated between the means of the two groups on error scores B, is significant at the .005 level for a directional test.

TABLE 6

MEANS AND VARIANCES FOR RIGIDITY PER CENT SCORES:

COCHRAN AND COX *t* TEST

GROUP	N	MEAN	VARIANCE	df	t	p*
EMR	30	30.200	392.993	29	4.595	<.0005
NON-RETARDED	30	39.900	136.852	29		

* Critical value for one-tailed test *t* .0005 = 3.659

TABLE 7

MEANS AND VARIANCES FOR GUESSED RESPONSE SCORES:

COCHRAN AND COX *t* TEST

GROUP	N	MEAN	VARIANCE	df	t	p*
EMR	30	5.433	43.289	29	3.992	<.0005
NON-RETARDED	30	6.567	1.289	29		

* Critical value for one-tailed test *t* .0005 = 3.659

TABLE 8

MEANS AND VARIANCES FOR ERROR SCORES A:

COCHRAN AND COX *t* TEST

GROUP	N	MEAN	VARIANCE	df	t	p*
EMR	30	4.467	18.395	29	5.021	>.0005
NON-RETARDED	30	0.400	1.214	29		

* Critical value for one-tailed test *t* .0005 = 3.659

TABLE 9

MEANS AND STANDARD DEVIATIONS FOR ERROR SCORES B:

t TEST

GROUP	N	MEAN	S. D.	df	t	p*
EMR	30	2.433	1.233	58	2.785	>.005
NON-RETARDED	30	1.533	1.280			

* Critical value for one-tailed test *t* .005 = 2.660

Interpretation of the Results

Rigidity per cent score represents the percentage of placements which the individual made according to a single preferred, though incorrect, system. As subjects were immediately informed of their success or failure on each placement involved in Vygotsky test performance, rigidity per cent score was interpreted in this instance to indicate the inability of the individual to choose an alternative basis of classification or, at least, an inability to verbalize an alternative schema. The finding of a significant difference between EMR and non-retarded subjects in rigidity per cent score suggests that EMR subjects more frequently rely on stereotypic patterns of behavior, specifically verbal patterns, than do non-retarded subjects of equivalent mental age.

A second aspect of Vygotsky test performance, guessed response score, was interpreted as an indication of inability to supply a verbal label to a completed motor action. The finding of a significant difference between the abilities of EMR and non-retarded subjects of equivalent MA to explain a completed behavior suggests that the performances of retardates, on this task, tended to be under less verbal control than were the performances of non-retardates. The findings that retardates employ stereotyped verbal responses and "guessed" responses more frequently than non-retardates suggest that their verbal systems function less effectively in a problem solving situation than might be expected on the basis of MA. Lesser ability to explain or label a completed act, on the part of the retardate

sample, implies less reliance on verbal pre-planning of responses as well.

Error score A, errors of placement on second administration, was interpreted as reflecting an inability to utilize either verbal cues from an external source or self-verbalized cues to direct subsequent activity. The finding of a significant difference between groups on error score A suggests that retardates more frequently dissociate their actions from verbal direction. Although they appeared capable of forming "complexes", groupings formed on the basis of temporal or spatial contiguity or perceived similarities or differences, the retarded individuals appeared less able to form groupings on a verbally directed basis.

Errors in transference of the Vygotsky concepts, error score B, was considered a measure of an inability to employ a verbally cued concept as a mediator of subsequent behavior. The finding of a significant difference between EMR and non-retarded subjects in error score B suggests that verbal cues have less directive meaning to retardates than to non-retardates.

The retarded child, although capable of adequately verbalizing the conjunctive category which would accurately direct his transference task, appeared significantly less able to apply the principle than did the non-retarded subject of equivalent MA. Rather than assuming the role of conveying concepts, the nonsense syllables appeared relatively meaningless to the actual choice behavior of the retardates. Choices appeared to be made on the basis of perceived similarities rather than on the

basis of abstracted attributes more frequently in the EMR sample than in the non-retarded sample.

The possibility was not ruled out that subjects did not fully understand the intent of the examiner; however, when questioned about their choice, the EMR subjects often verbalized the correct criteria while appearing unaware that their actual choices did not reflect these characteristics. It is interesting to note that, during this phase of task completion, no EMR subject changed his original choice upon being questioned regarding his choice rationale, whereas several non-retarded subjects became aware of errors at this stage and explained how they would have changed their original choice if this had been allowed.

Summary

The finding of significant differences between EMR and non-retarded subjects of equivalent MA on a number of measurable behaviors has been interpreted within a verbal mediational framework. Within the experimental situation, the EMR sample appeared less able to formulate new verbal rules, exhibiting, instead, stereotyped verbal responses despite correction by the examiner. The EMR sample appeared less able to formulate verbal rationale for completed actions, which implies, as well, that verbal preplanning of appropriate overt responses may be deficient. Following self-verbalization of the correct principles of behavior, the EMR subjects appeared less able to regulate their actions through their own speech. Finally, the finding that the EMR

sample made more errors in transferring previously verbalized concepts to a new set of stimulus objects was interpreted as suggesting that the actions of retardates may tend to be under less verbal control than the behaviors of the non-retardates.

CHAPTER VI

IMPLICATIONS OF THE STUDY

Luria has postulated the existence of a specific learning defect underlying retardation, which renders the retardate deficient in a number of verbally based skills. A review of relevant Soviet and Western research suggested the need for more rigorously controlled investigations regarding both subject and experimental variables, than those generally presented.

Summary of the Study

The present study was proposed to examine the comparative verbal and mediational skills of samples of educable mentally retarded (EMR) and non-retarded children of equivalent mental age. Senior opportunity room students ($\overline{CA}$ 16.4; $\overline{IQ}$ 69.8; $\overline{MA}$ 11.5) and non-retarded students maintaining regular school progress ($\overline{CA}$ 10.7; $\overline{IQ}$ 105; $\overline{MA}$ 11.0) were compared on mean scores obtained during performance of a verbally based concept formation task and a transference task involving the same set of verbally cued concepts. Differing language skills have been related to sex (Goda & Griffith, 1962; Sirkin & Lyons, 1941; Spradlin, 1960) and to socio-economic status (Bernstein, 1958, 1959, 1960, 1961, 1965; Irwin, 1948; McCarthy, 1954); therefore, these variables were controlled between samples.

Within the Lurian framework, retardation constitutes a specific learning defect rather than global arrested development. Therefore, it was hypothesized that the performances of retar-

dates, when compared to performances of non-retarded subjects of equivalent MA, would be inferior on a number of objectively defined behavioral variables.

Verbal behaviors and mediational skills were examined through certain aspects of performance on the Vygotsky Test of Concept Formation, objectively defined by the Penny (1951) scoring system, and through performance on a subsequent concept transference task. The presentation of nonsense syllables designating specific conjunctive categories relevant to task success was presumed to equalize the initial level of task difficulty, negating the effects of varying experiential histories and of varying levels of vocabulary development. Four aspects of behavior were considered most relevant to the Lurian position: rigidity per cent score, guessed response score, error score A, and error score B.

Rigidity per cent score represents the percentage of block placements made on the basis of a preferred, previously corrected, system. The finding of a significant difference (t = 4.595; $p < .0005$) between the mean scores of the EMR (59.3) and non-retarded (39.9) samples on this variable was interpreted as indicating that retardates exhibit a greater number of stereotyped verbal responses than do non-retardates and that they are less able to devise new verbal patterns to meet the demands of a particular situation.

Guessed response score represents the number of block placements for which no verbal rationale is subsequently available. The finding of a significant difference (t = 3.99; $p < .0005$) be-

tween the mean scores of EMR (5.43) and non-retarded (0.57) samples on this variable was interpreted as indicating that the behaviors of retardates are less frequently verbally directed and that retardates less often formulate verbal plans for their actions than do non-retardates.

Error score A represents the number of errors of placement made by the individual on second administration of the task, following verbalization of the arbitrarily designated "correct" principle by both the task administrator and the subject. Mean scores of 4.47 and 0.4 were obtained by EMR and non-retarded samples, respectively, on this variable. The finding of a significant difference ($t = 5.021$; $p < .0005$) between samples was interpreted as indicating that retardates are inferior in their ability to regulate their behavior in compliance with the demands of either their own speech or that of others. Although EMR subjects were able to verbalize the appropriate principle for task success, they were less able to apply the principle to their behavior than were non-retardates of equivalent MA.

Error score B represents the number of errors per individual on a task requiring the transfer of the four acquired conjunctive categories designated as lag, cev, bik, and mur to a second set of stimuli. Again, pre-task performance involved verbalization of the categorical attributes by the subject. In the transference task stimuli, only relevant attributes were allowed to vary; irrelevant stimulus dimensions (form and color) were controlled. The finding of a significant difference ($t = 2.785$; $p < .005$) between the mean error scores B of the EMR

(2.43) and non-retarded (1.53) samples was interpreted as indicating that the EMR subjects were inferior in their ability to employ verbalized criteria. Despite their ability to state the principles which would correctly direct their behavior, the EMR subjects again appeared less able to order their perception and choice behaviors to meet the demands of their own verbal cues.

The acceptance of four hypotheses regarding the comparative verbal skills of EMR and non-retarded subjects of equivalent MA lends credence to the theoretical position from which they were derived. Retardates appeared inferior in formulating new verbal patterns, in verbally planning and rationalizing actions, and in regulating behavior to meet the demands of the speech of others and of self-verbalized cues. These findings appear supportive of Luria's conclusion that the major deficiencies observable in retardation are an underdevelopment of the verbal system and a dissociation of the verbal system from the activities of the individual. Verbal behavior did, indeed, appear to be a faulty regulator of other behaviors.

However, support for the Lurian position is limited to the finding of four verbal deficiencies exhibited by an EMR sample in comparison to a non-retarded sample of equivalent MA. The present study offers no support for the contention that retardates are characterized by a <u>specific</u> verbal learning defect as a comparison of non-verbal learning abilities was not included.

<u>Implications for Education</u>

Some investigators have reported that the discrimination

performances of retardates may be improved through pre-training of appropriate verbal cues (Barnett, Ellis, & Pryer, 1959; Cantor & Hottel, 1957; Smith & Means, 1961). Others (Luria, 1957, 1959; Miller & Griffith, 1961; Rieber, 1964) have suggested that verbal training has a limited effect on the subsequent behavior of retardates, particularly under varying conditions.

In the present study, also, language appeared to serve a limited function in retardates. The primary implication, specific to educational method, relates to the disability of retardates to fully utilize overt verbal cues. Instruction of the educable mentally handicapped individual remains, despite his limitations, primarily verbal. Other methods of instruction may exhibit greater utility in the training of the mentally handicapped than does verbal instruction.

Several recent studies (Hoelke, 1966; Kirk, 1964; Smith & Kennedy, 1967) have indicated that public school special classes offer no discernible benefit to the EMR student relative to his EMR peer in regular classes in terms of either academic or social-emotional development. Although this effect has been attributed to problems of motivation in both staff and student (Johnson, 1962), it would appear equally explicable in terms of traditional verbal teaching methods and, to a large extent, academic curricula, employed with both special and regular class EMR students.

As retardates appear unlikely to learn best through purely verbal channels, it appears the educator would be well advised to concentrate on other instructional channels, supplemented

with relevant verbal cues. Zeaman (1965) has proposed a pattern of instruction which appears to suit the needs of trainable retardates through a de-emphasis of verbal learning. Attention theory postulates that the more advantageous approach to the education of the trainable retardate is to teach him (a) to attend to relevant visual cues and (b) to respond appropriately to these cues. That is, the retardate is taught to use visual, rather than verbal, mediators. Verbal instruction, although necessary, would fulfil a secondary role as an instructional medium.

The second implication for education, derived from the present study, would be that retardates require the implementation of remedial language programs. Although the retardate may be qualitatively or quantitatively impaired in verbal functioning, programs of language development, to maximize verbal capacities, appear a necessary consideration in any program for the mentally handicapped.

Language development programs with varying retardate groups have yielded equivocal results (Bowman, 1960; Ezell, 1960; Hartman, 1958; Johnson, Capobianco, & Miller, 1960; Kolstoe, 1958; Lassers & Low, 1960; Lubman, 1955; Mecham, 1955; Rigrodski & Steer, 1961; Schlanger, 1953; Schneider & Vallon, 1955); however, methodological errors, randomized rather than controlled variables, and lack of control groups render some findings questionable. The type of sequential language program advocated by Richardson (1967), stressing the development of "conceptual language", appears worthy of further consideration.

Implications for Research

The specificity of the verbal learning defect observed in retardates appears amenable to further investigation. Studies employing analogous verbal and non-verbal learning situations with retarded individuals appear necessary to examine the relative strengths of learning abilities exhibited by these subjects. The premise of the investigations of Milgram (1966) and Milgram and Furth (1963, 1965), that retardates are inferior in the acquisition of verbal labels rather than in underlying concept development, appears to require further consideration.

Ellis (1963) has proposed that retardation is attributable to "neuropathology," causing impairment in the ability to maintain a stimulus trace in sufficient strength and length for associations to be formed. The behavioral consequences of this type of specific impairment would appear synonymous to those derived from a Lurian framework. Further investigation into the neurological basis of both normal and retarded functioning would appear to be relevant to an acceptance of the suppositions of either Luria or Ellis. The retardate sample utilized in the present study was suggested to be familial or idiopathic in origin; however, it appeared functionally synonymous to the neurologically impaired sample described by Luria (1963). Support of Lurian based postulates concerning the functioning of a purportedly non-neurologically impaired sample implies that other Soviet theoretical and educational suppositions may have applicability to training and research involving diversified samples of retardates. The comparability of performances of retar-

dates of known neurological impairment to those of presumed familial or idiopathic origin must be further investigated to delineate the applicability of, at least, the behavioral aspects of the Lurian model.

Limitations of the Study

Although the present study has been designed wholly within the Lurian position concerning retardation, it seems worthwhile to note that other theoretical frameworks appear to be of equal applicability in considering the dynamics underlying retardation. Specific to the reported behavioral differences, an interpretation within the framework devised by Ellis (1963), by Milgram and Furth (1963, 1965), or by Zeaman and House (1963) would have been acceptable to the present investigator. The choice of the Lurian postulate, leading to the interpretation of defined behaviors as a consequence of specific language functions, was made at the discretion of the researcher.

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APPENDIX A

DESCRIPTION AND TRADITIONAL ADMINISTRATION OF THE VYGOTSKY BLOCK TEST

APPENDIX A

DESCRIPTION AND TRADITIONAL ADMINISTRATION OF THE VYGOTSKY BLOCK TEST

The material used in the concept formation test consists of 22 wooden blocks varying in color, shape, height and size. There are 5 different colors, 6 different shapes, 2 heights (the tall blocks and the flat blocks), and 2 sizes of the horizontal surface (large and small). On the underside of each figure, which is not seen by the subject, is written one of the four nonsense words: lag, bik, mur, cev. Regardless of color or shape, lag is written on all tall large figures, bik on all flat large figures, mur on the tall small ones, and cev on the flat small ones. At the beginning of the experiment all blocks, well mixed as to color, size and shape, are scattered on a table in front of the subject.... The examiner turns up one of the blocks (the "sample"), shows and reads its name to the subject, and asks him to pick out all the blocks which he thinks might belong to the same kind. After the subject has done so ... the examiner turns up one of the "wrongly" selected blocks, shows that this is a block of a different kind, and encourages the subject to continue trying. After each new attempt another of the wrongly placed blocks is turned up. As the number of the turned blocks increases, the subject by degrees obtains a basis for discovering to which characteristics of the blocks the nonsense words refer. As soon as he makes this discovery the ... words ... come to stand for definite kinds of objects (e.g., lag for large tall blocks, bik for large flat ones), and new concepts for which the language provides no names are thus built up. The subject is then able to complete the task of separating the four kinds of blocks indicated by the nonsense words. Thus the use of concepts has a definite functional value for the performance required by this test. Whether the subject actually uses conceptual thinking in trying to solve the problem ... can be inferred from the nature of the groups he builds and from his procedure in building them. Nearly every step in his reasoning is reflected in his manipulations of the blocks. The first attack on the problem; the handling of the sample; the response to correction, the finding of the solution -- all these stages of the experiment provide data that can serve as indicators of the subject's level of thinking (Hanfmann in Vygotsky, 1966, pp. 56-57).

APPENDIX B

PENNY (1951) METHOD OF ADMINISTRATION

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PENNY (1951) METHOD OF ADMINISTRATION

PROCEDURE

There are three PARTS to the administration procedure for the Vygotsky Test; if a subject is able to complete PART 1 it is assumed that he would have been able to complete PARTS 2 and 3. If PART 1 is "failed" then PART 2 is attempted; if PART 2 is failed also then PART 3 is attempted.

Part 1

(a) Spread the 22 blocks (with "names" downwards) before the subject in front of the sorting board. The blocks should be about equal distance from each other and randomly distributed.

The "sorting board" is simply a piece of cardboard 6" X 20" divided into four 5" X 6" sections. The four nonsense syllables LAG, CEV, BIK, MUR are printed on these sections.

(b) Say to the subject, placing emphasis on the words printed in capital letters:

> 'Here are 22 different looking blocks. Though they all LOOK different they can REALLY be sorted into four different kinds. Each of these kinds has a name. This one (orange triangular Mur) is a Mur. (Place it, name upwards, in the Mur section of the sorting board). The names of the others are Lags, Cevs, and Biks. Now, what I want you to do is to take the blocks ONE BY ONE and sort them into the four different groups. Don't turn the blocks up-side-down because the names are underneath. I suggest that you start

by picking out the Murs and putting them here. (Indicate the Mur section of the sorting board). After each move I'll tell you if you are right or not (make sure subject understands but do not give any clues, answers to leading questions, or analogies. Instructions may be repeated if required.) Right, go ahead! '

(c) Note relevant test behavior prior to first move, for example, preliminary sorting of the blocks into color groups. Note similar behavior throughout test.

(d) Ascertain the subject's sorting system (whether by Form, Color, Height, etc.) after each move. Enter the appropriate symbol(s) on the Record Form.

(e) If the subject sorts correctly and gives correct reason say: 'That's right.'

(f) If the subject sorts correctly but gives wrong reason say 'That's in its right place, but you have given me the wrong reason.' If two consecutive moves are 'right' for the same 'wrong' reason then indicate why the reasoning is faulty. For example, if Height is used as the sorting system for two consecutive moves in the Bik section, then draw attention to the fact that the Cevs are also the same height.

(g) If the subject sorts incorrectly, ascertain his system and move the block, name upwards, to the correct section of the board saying: 'That's not right because it's a .....' (giving the correct name of the block). These corrections are regarded as 'clues' and should be appropriately indicated on the Record Form.

(h) Continue until all blocks have been sorted.

(i) Test is regarded as 'solved' if five or more of the last moves are according to the correct system. If less than five moves are correct then repeat the test according to the following procedure:

(i) Turn all blocks name downward. Randomize them. Place as they were placed prior to the commencement of the test proper.

(ii) Say to the subject 'Now, just to make sure that you've got it right, I want you to try and put the blocks into their four groups just as they were before I mixed them up.'

(iii) No clues to be given.

(iv) The subject is not penalized for confusing the names of the groups so long as the members of the four groups are correct.

(j) If the test is still 'failed' then proceed to PART 2 of the procedure.

Part 2

(a) N. B. PART 2 should not be attempted before PART 1.

(b) The 22 blocks are grouped according to the correct principle, names downwards. The principle is explained to the subject in the following manner: 'These are the tall, wide ones (indicating the Lags but not referring to them by name); these are the tall, narrow ones (the Murs); these are the flat, wide ones (the Biks); and these are the flat, narrow ones' (the Cevs).

(c) Allow the subject to look at the blocks for approximately 15 seconds.

(d) Say to subject: 'Now I'm going to mix them up and when I have finished I want you to put them into their groups JUST AS THEY ARE NOW.'

(e) Randomize the blocks slowly.

(f) Say to subject : 'Right, go ahead.'

(g) For adequate performance the blocks must be grouped 100 per cent correctly. No clues are to be given. Record relevant test behavior and the number and type of errors if his performance is adequate.

(h) If the subject fails on this section of the test then proceed to PART 3 administration.

Part 3

(a) N. B. PART 3 should not be attempted before PART 2.

(b) The blocks are placed in random order in front of the subject. The sorting board is removed.

(c) Say to subject: 'I'll show you another way that it can be done.' (Separate the blocks into five groups according to color. Do not refer to 'Color').

(d) Allow subject to look at the blocks for approximately 15 seconds.

(e) Say to subject: 'Now I'm going to mix them up and when I have finished I want you to put them into the five groups JUST AS THEY ARE NOW.'

(f) Randomize the blocks slowly.

(g) Say to the subject: 'Right, go ahead.'

(h) As for (g) in PART 2.

(i) If the subject fails on this section of the test then bring the test situation to a close. If he succeeds then proceed as follows. Say to the subject: 'Now I'll show you another way it can be done' (Separate the blocks into six groups according to Form. Do not refer to 'form' or 'shape' etc.).

(j) As for (d), (e), (f), (g) and (h) above except that 'six' is substituted for 'five' in (e).

(k) If the subject fails on this section of the test then bring the test situation to a close. If he succeeds then proceed with:

(i) Height - 2 groups

(ii) Width -- 2 groups

(iii) Height and Width combined - the 'correct' system -- 4 groups.

Procedure is the same except for the necessary alterations to (c) and (e) above (Penny, 1951, pp. 67-70).

APPENDIX C

VYGOTSKY DATA COLLECTION MATERIALS

APPENDIX C

VYGOTSKY DATA COLLECTION MATERIALS

VYGOTSKY RECORDING SYSTEM

The recording of the sorting system which the subject uses is facilitated by the use of the following symbols:

Common Systems

H Height

W Width

Sa Surface area

F Form (shape)

C Color

V Volume

Uncommon Systems

f 'Poor' forms (the matching of a triangle to a trapezoid because 'one is an incomplete version of the other'; also, use of concepts such as 'angularity' or 'number of sides')

M Mixed (the use of 'one of each kind' type of system)

E Equality (the blocks are placed together because of equality of numbers, colors, or forms in each group)

? Guessed

M^F Mixed forms

P Patterns (the blocks are fitted together in order to 'make' something, 'towers' or other complex patterns)

M^f Mixed 'poor' form

(Penny, 1951, pp. 71-72).

VYGOTSKY RECORD FORM

Name:

Age:

Sex:

Date:

Move No.	System	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

(Penny, 1951, p. 71)

VYGOTSKY TABULATION SHEET

NAME: AGE:

SEX: DATE:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
H																						cm
W																						clues
Sa																						
F																						Rev.
C																						
V																						systems used

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
f																						C:Us
M																						
E																						C:Um
?																						
M^F																						M:S
P																						
M^f																						R per cent

APPENDIX D

REVISED VYGOTSKY TEST ADMINISTRATION

APPENDIX D

REVISED VYGOTSKY TEST ADMINISTRATION

PROCEDURE

There were two parts in the administration of the Vygotsky test used in this study; both parts were administered to all subjects.

Part 1

(a) The blocks were spread, 'names' downwards, to the right of the sorting board, which was placed directly in front of the subject. The sorting board was a piece of cardboard 12" X 18" divided into four sections 6" X 9".

(b) The following instructions were given:

> 'Here are 22 different looking blocks. Though they all look different, they can really be sorted into four different kinds. Each kind has a made-up name. The names of the kinds are lags, cevs, biks, and murs. Now, what I want you to do is to take the blocks one at a time and put them into the four different groups they should be in. I want you to put all the murs together in one group on one part of this board, all the cevs together on another part, and the group of biks and the group of lags on the other two parts of your board. You can choose any block you want and you can work as slowly as you like. Don't turn the blocks over while you are working because the names are underneath. After you have put a block where you think it should go, I want you to tell me why you put it there. Then, turn the block over, after you tell me, to look at its name and see if you were right. If you were not right, you can move the block to the group it should really be in, and go on with the rest of the blocks. Mistakes don't count, so don't worry about them.
> Remember, pick up only one block at a time, put it down without looking at its name, and tell me your reason.
> All right, start when you are ready.

(c) The subject's responses were entered verbatim on the Vygotsky Record Form.

(d) Following each move, the subject was allowed to correct

his errors in placement if necessary. With this exception, administration was completed as described by Penny, Part 1 (e), (f), (g), and (h).

(e) Blocks were then grouped closely together on the sorting board. The subject was asked to describe the way in which biks (cevs, lags, murs) were the same. If he was unable to do so correctly, he was asked if the blocks were all the same height and the same width (just as tall and just as wide as all the others). He was then asked which two kinds of blocks were tall and which two kinds were short or flat, which two kinds were fat and which two kinds were thin or skinny. Lastly, he was asked to describe each group (what two words did we use to tell how lags (cevs, biks, murs) were all the same). This procedure was repeated until the subject was capable of independently verbalizing the appropriate characteristics designated by each syllable.

Part 2

(a) The subject was requested to help the examiner remove the blocks from the sorting board and place them as they were initially.

(b) The subject was then instructed:

> 'Now, I want you to sort the blocks into those four groups again, just as they were, without looking at the names. Remember, all the lags are tall and wide, cevs are flat and skinny, biks are flat and wide, and murs are tall and skinny.
> This time, I don't want you to tell me what you are doing. Work without stopping until you have all the blocks in the groups they should be in. Start when you're ready.

(c) When the subject indicated he was satisfied with his com-

pleted task, the number of errors in resorting (error score A) was recorded at the bottom of the Vygotsky Record Form.

(d) A cylindrical form from each category was removed and placed near to the subject, name upwards. The following instructions were given:

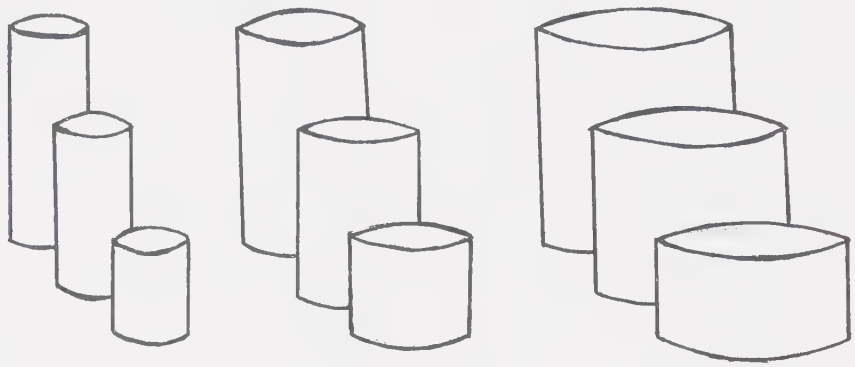
> 'I want you to do one more little job but first we have to look at these blocks again. Here are a lag, a cev, a bik, and a mur. Tell me, how are all lags (cevs, biks, murs) the same? Why is this one a lag, (cev, bik, mur)?

(e) The appropriate characteristics were elicited from each subject. If the subject experienced difficulty with this part of the task, the procedure described in Part 1 (e) was followed.

APPENDIX E

STIMULUS MATERIAL FOR TRANSFER TASK

The stimulus materials presented were adapted from those described by Bruner and Kenney (1966, p. 156). The set of materials consisted of nine white plaster cylinders arranged in a three by three matrix. The cylinders varied three degrees in height and three in width. They were presented to each subject, following completion of the Vygotsky test, as shown in the diagram below.



SUBJECT

The following instructions were given, accompanied by appropriate gestures:

> 'Look at this set of larger blocks. These blocks are all different sizes. If you look down the rows of blocks this way, you can see that this row of blocks is tall, and this row is middle-sized, and this row is short or flat. Now if you look at the rows the other way, you see that these blocks are all thin or skinny, and these are middle-sized, and these are all wide or fat.
> Now, this is the job I want you to do. Show me which one of these blocks would be the best one to name a lag; which one would you put the name lag on? Why should that one be called lag?'

Questions were repeated for the syllables cev, bik, and mur. The number of errors in transfer (error score B) and the verbal responses given by each subject were recorded at the

bottom of his Vygotsky Record Form.

APPENDIX F

SUBJECT DATA

APPENDIX F

SUBJECT DATA

TABLE 10

SUBJECT DATA: EMR SAMPLE

SUBJECT	IQ	CA	MA	SEX	SES INDEX
01	76	18.9	14.3	F	45.48
02	78	18.2	14.2	M	---
03	76	18.4	13.11	M	37.90
04	77	17.0	13.1	M	32.14
05	80	16.1	12.10	F	30.03
06	80	16.0	12.10	M	39.66
07	80	15.11	12.9	F	34.38
08	73	17.2	12.6	M	35.05
09	80	15.7	12.6	F	39.66
10	75	16.7	12.5	F	29.18
11	80	15.5	12.4	F	30.00
12	77	15.11	12.3	F	41.43
13	75	15.6	11.8	M	37.14
14	70	16.7	11.7	F	34.06
15	72	15.11	11.6	F	---
16	72	15.5	11.1	M	30.48
17	68	16.0	10.11	F	33.38
18	59	18.2	10.9	M	33.29
19	71	15.1	10.9	F	30.03
20	63	16.10	10.7	M	28.22
21	72	14.8	10.7	F	28.22
22	68	15.4	10.5	M	44.32
23	66	15.4	10.1	F	27.25
24	60	16.7	9.11	F	49.55
25	56	17.5	9.9	F	44.00
26	61	15.6	9.6	M	32.77
27	61	15.5	9.5	M	34.38
28	59	15.8	9.3	F	30.48
29	55	16.2	8.11	M	27.25
30	53	16.9	8.11	F	27.25
N	30	30	30	30	28
MEAN	69.77	16.4	11.5		34.61

TABLE 11

SUBJECT DATA: NON-RETARDED SAMPLE

SUBJECT	IQ	CA	MA	SEX	SES INDEX
31	119	11.9	14.0	M	39.67
32	101	13.1	13.3	F	30.03
33	106	12.4	13.1	M	29.31
34	104	12.5	12.11	M	34.77
35	113	11.4	12.10	M	---
36	101	12.4	12.6	F	34.38
37	93	13.3	12.4	F	29.31
38	98	12.4	12.1	M	29.90
39	105	11.5	12.0	M	29.90
40	93	12.6	11.8	F	37.30
41	103	11.3	11.7	M	29.93
42	112	10.3	11.6	M	35.80
43	119	9.5	11.3	M	29.31
44	115	9.7	11.0	M	28.76
45	91	11.11	10.10	F	26.57
46	115	9.5	10.10	M	28.22
47	112	9.8	10.10	M	35.80
48	108	9.7	10.4	M	45.48
49	92	11.2	10.3	F	44.27
50	109	9.5	10.3	M	34.38
51	99	10.4	10.3	M	29.31
52	117	8.6	9.11	M	39.66
53	118	8.4	9.10	F	32.79
54	99	9.10	9.9	F	29.31
55	102	9.6	9.8	M	26.57
56	107	8.10	9.5	F	62.04
57	108	8.7	9.3	M	39.55
58	90	10.3	9.3	F	31.86
59	101	9.1	9.2	F	30.48
60	100	8.10	8.10	M	34.05
N	30	30	30	30	29
MEAN	105.00	10.7	11.0		34.42

APPENDIX G

RESPONSE DATA

APPENDIX G

RESPONSE DATA

TABLE 12

RESPONSE DATA: EMR SAMPLE

SUBJECT	RIGIDITY % SCORE	GUESSED RESPONSE SCORE	ERROR SCORE A	ERROR SCORE B
01	62	13	5	0
02	43	9	0	1
03	67	0	0	2
04	38	8	0	3
05	57	0	9	2
06	38	7	0	2
07	43	0	11	4
08	29	0	0	3
09	67	0	2	3
10	81	0	2	3
11	62	3	2	4
12	48	10	4	4
13	100	0	2	2
14	48	1	0	1
15	57	5	1	2
16	81	0	6	1
17	71	0	0	0
18	57	0	0	4
19	52	0	12	3
20	52	10	6	2
21	71	15	7	1
22	100	21	13	3
23	29	4	3	2
24	48	3	10	1
25	52	0	11	3
26	33	7	6	4
27	43	9	2	4
28	90	19	2	2
29	67	0	8	3
30	90	19	10	4
MEAN	59.2	5.43	4.47	2.43

TABLE 13

RESPONSE DATA: NON-RETARDED SAMPLE

SUBJECT	RIGIDITY % SCORE	GUESSED RESPONSE SCORE	ERROR SCORE A	ERROR SCORE B
31	19	0	0	0
32	48	0	0	0
33	33	0	0	1
34	48	0	0	4
35	43	0	0	2
36	38	2	0	1
37	52	0	0	1
38	48	0	0	0
39	24	0	0	1
40	29	5	3	3
41	33	0	0	2
42	33	0	0	1
43	48	0	0	4
44	33	0	0	2
45	38	1	0	2
46	33	0	0	0
47	43	1	1	1
48	24	0	0	3
49	38	3	0	1
50	48	0	0	3
51	43	2	5	4
52	19	1	0	0
53	43	0	0	1
54	29	1	0	1
55	57	0	0	0
56	43	0	0	0
57	43	0	0	2
58	43	1	0	3
59	38	0	2	1
60	76	0	1	2
MEAN	39.9	0.57	0.4	1.53